

REMARKS

In view of the above amendments and the following remarks, reconsideration of the objections and rejections set forth in the Office Action of May 24, 2004 is respectfully requested.

The Examiner objected to the title of the invention as not being sufficiently descriptive, and suggested a new title. In this regard, the Examiner's attention is directed to the new title presented above, which is similar to the Examiner's suggested title. Because the new title clearly indicates the invention to which the claims are directed, it is respectfully submitted that the Examiner's objection to the specification has been overcome.

In addition to presenting the new title as discussed above, the entire specification and abstract have been reviewed and revised in order to make various editorial corrections. As the revisions are quite extensive, the amendments to the specification and abstract have been incorporated into the attached substitute specification and abstract. For the Examiner's benefit, a marked-up copy of the specification indicating the changes made thereto is also enclosed. No new matter has been added by the revisions. Entry of the substitute specification is thus respectfully requested.

The Examiner has objected to Figures 1 and 2 because those drawings require a legend such as "Prior Art" as only that which is old is illustrated. In addition, upon reviewing the application, it was noted that Figure 4 includes four different drawings separately identified as Figures 4A-4D within the specification, but not separately identified in the drawings. Thus, in order to address the above matters, a set of new formal figures has been prepared and submitted herewith. In particular, new Figures 1 and 2 have been prepared to include the label "Prior Art" as required by the Examiner, and original Figure 4 has been renumbered as new Figures 4A, 4B, 4C, and 4D. Because these are the only changes to the original drawings, and because none of these changes introduce any new matter, the Examiner is respectfully requested to enter the new Figures 1, 2, and 4A-4D. Furthermore, in view of the new formal Figures, it is respectfully submitted that the Examiner's objection to the drawings has been overcome.

Claims 1-12 were originally pending in this application, although claims 7-12 have been withdrawn in view of the Response to the Restriction Requirement filed March 11, 2004. Consequently, non-elected claims 7-12 have now been cancelled as indicated above.

The Examiner rejected elected claims 1-6 as being unpatentable over the Applicants' Admitted Prior Art (AAPA) in view of the Weitzel reference (USP 5,693,969). However, these rejections are respectfully traversed. For the reasons discussed below, it is respectfully submitted that claims 1-6 are clearly patentable over the prior art of record.

The present invention has been developed in order to address several problems concerning conventional semiconductor devices. As an initial matter, as explained on page 1, line 25 through page 2, line 8 of the original specification, conventional semiconductor devices have a layer of, for example, AlGaAs having Schottky contact with a gate electrode. However, when the surface of the AlGaAs is exposed during the manufacturing process, a natural oxide film is formed on the surface, thereby undesirably increasing the surface level density of the layer. In order to address this problem, the present invention as recited in independent claim 1 provides a Schottky layer having Schottky contact with a Schottky electrode, in which the Schottky layer includes In and P, which restrains the formation of the natural oxide film on the Schottky layer, as discussed on page 3, lines 2-5 of the original specification.

However, this modification creates the problem discussed on page 3, lines 8-16 of the original specification. Specifically, diffusion will occur at the Schottky interface between the Schottky electrode and the Schottky layer including In and P during manufacture of the semiconductor device. As a result, the Schottky characteristics of the semiconductor device deteriorate, and leakage current of the Schottky interface will undesirably increase. In view of this problem, the present Inventors have determined that if the portion of the Schottky electrode that touches the Schottky layer including In and P is composed of a material whose main constituents are La and B as recited in independent claim 1, this problem would be overcome. In particular, as explained on page 4, lines 14-21 of the original specification, a semiconductor device in which the Schottky layer is composed of a compound including In and P, and in which a portion of the Schottky electrode touching the Schottky layer is composed of a material with the main constituents of La and B, the surface level density of the Schottky layer will be minimized, *and* the semiconductor device will have superior thermal stability and good Schottky characteristics.

The AAPA as illustrated in Figure 1 includes a Schottky layer 126 that includes In and P. However, the AAPA does not disclose a Schottky electrode having a portion touching the Schottky layer, in which the portion is composed of material whose main constituents are La and B. Nonetheless, the Examiner notes that the Weitzel reference discloses a Schottky gate 16 that is formed of LaB₆ (Lanthanum Hexaboride), and the Examiner asserts that it would have been obvious to one of ordinary skill in the art to employ the Schottky gate of the Weitzel reference as the gate electrode of the AAPA in order to increase the breakdown voltage of a FET without affecting the frequency response and the transconductance. However, the Applicants respectfully disagree with the Examiner for the reasons discussed below.

Firstly, in contrast to the Examiner's reasoning, the Weitzel reference does not teach that the use of a Schottky gate of LaB₆ material would increase the breakdown voltage of a FET. Instead, the Weitzel reference teaches the use of damage layers 17, 18 on the surface of channel layer 12 in order to increase the breakdown voltage of the transistor (see column 2, lines 10-18 of the Weitzel reference). Thus, it is submitted that one of ordinary skill in the art would not be motivated by the Weitzel reference to employ the Schottky gate formed of LaB₆ material in order to increase breakdown voltage without affecting the frequency response and the transconductance.

Secondly, in the present invention as explained above, a Schottky electrode in which the portion touching the Schottky layer is composed of a material whose main constituents are La and B is employed in order to reduce diffusion of the Schottky electrode material into a Schottky layer that *includes In and P*, thereby providing good Schottky characteristics. As explained in column 3, lines 53-54 of the Weitzel reference, however, the Schottky layer 12 of the Weitzel reference is formed of *GaAs (gallium arsenide)*, and there is no suggestion that the Schottky layer 12 includes In and P. Thus, the problem of diffusion and the resulting decrease in the Schottky characteristics is not a concern in the invention of the Weitzel reference, and the Weitzel reference would provide no motivation to use a Schottky electrode of La and B when such electrode is to contact a Schottky layer including In and P.

As noted above, the Weitzel reference employs damage layers in order to increase the breakdown voltage of the FET, rather than relying on the material of the Schottky electrode.

Furthermore, because the Schottky layer 12 does not include In and P, there is little concern for the diffusion of the Schottky gate material into the Schottky layer 12. Therefore, it is respectfully submitted that one of ordinary skill in the art would not be motivated by the Weitzel reference to modify the AAPA so as to obtain the invention recited in independent claim 1. Accordingly, it is respectfully submitted that independent claim 1 and the claims that depend therefrom are clearly patentable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance. However, if the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact the Applicant's undersigned representative.

Respectfully submitted,

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